I – Problem Statement Title (04-EQ092)

Testing of Pile Extension Connections to Slab Bridges

II – Research Problem Statement

Question: What pile extension connection details should be used on slab bridges to limit the transfer of seismic forces into the slab superstructure?

The proposed testing will address the specific need for designing and detailing slab bridges. These bridges are typically designed with minimal effort and commonly chosen by local agencies using readily available charts and standard sheets. Heavier truck loads and seismic loads have contributed in increasing the size of the supporting piles that induce larger loads into the superstructure. This change in practice rendered the Caltrans charts inadequate for many cases.

The research focuses on testing prototypes of precast and pipe pile extensions to slab superstructures. The results are needed to implement guidelines for the design of these connections.

III – Objective

The research objective is to gain identification of fundamental parameters that need to be included in implementing guidelines for the design of pin and fixed connections to superstructure slabs. The guidelines will focus on the ductility capacity of various types and sizes of pile extensions, in addition to superstructure design requirements. Alternative pin connections are to be tested to determine their ability to minimize the transfer of forces into the slab superstructure.

IV – Background

Current codes and specifications on the design of pile extensions to slab superstructures lack correlating test data. Caltrans Seismic Design Criteria (SDC) currently uses test data acquired from prototype box girder superstructures as a basis for slab bridge design guidelines. The Caltrans General Earthquake Committee has identified slab bridge design guidelines as a high priority for improvements. The proposed testing can make a substantial contribution in addressing those needs.

V – Statement of Urgency and Benefits

A. Support of the Departments Mission/Goals:
(Improving Mobility: Safety, and Reliability) Following the 1989 Loma Prieta earthquake, the Struve Slough Bridge was closed due in part to damage caused by the connection of the pile extensions to the slab superstructure. Avoiding damage to the superstructure is a paramount objective of the Caltrans Seismic Criteria. This objective is

important in ensuring bridges remain open following an earthquake by limiting the need to repair components below the bridge superstructure.

B. Return on Investment:

The objective of this proposal is to reduce economic impacts associated with post-earthquake bridge closures, constructability challenges and the accompanying costs of repairs in sloughs and over water where many slab bridges are located.

VI – Related Research

Parallel testing was conducted for column to box superstructure within the Caltrans Research Program..

VII – Deployment Potential

The results will be used to update and revise current design guidelines lacking maturity without substantiating data.